

The Hood Canal Coordinating Council's Technical Advisory Committee (TAC) on Aquatic Rehabilitation developed the following list of science questions through the TAC's workgroups on wastewater-OSS, stormwater and land use practices, and habitat. The goal of these science questions is to gather scientific information to inform policy and management recommendations to address the low dissolved oxygen (DO) problems in Hood Canal. The TAC workgroups asked that Hood Canal researchers review the following questions and answer the questions relevant to their work. It is anticipated that several questions may not have definitive or complete answers and that some questions may have multiple answers. We also recognize that there will be a range of answers from different researchers for a few of these questions, so please explore in your answer, if appropriate, why different perspectives exist. Please list any citations relevant to your responses or addressing any pertinent issues not captured in the questions.

The TAC workgroups believe that findings from the scientific research conducted in Hood Canal are an important component in developing policy and management recommendations. The responses to these questions will be shared with the TAC and with the HCCC Advisory Board. Please submit your responses to jhorowitz@hccc.wa.gov by **August 2, 2010**. Please include your name and experience/qualifications with your response. Thank you in advance for your participation.

Draft questions from TAC Workgroups for Hood Canal researchers --

A. Nitrogen and other pollutant sources within the Hood Canal watershed

1. What are the relative local contributions of nitrogen (N) to Hood Canal from current land uses/sources¹? Are these based on monitoring data or a model?
2. What is the level of confidence in answering question 1?
3. Geographically, what sources of N are most important in what locations? Particularly, areas with chronic or severe hypoxia (see Part B).
4. What are the seasonal patterns of N loading (by source) from the watershed to Hood Canal? What time periods or seasons are of greatest concern (see Part B)?
5. What is the estimated onsite septic system (OSS) N contribution to Lower Hood Canal (as a % of the total N loading)? How is this value derived? What is the confidence level in these values?
6. How does proximity to shorelines or tributaries effect contributions of OSS N to Hood Canal?
7. How much N loading occurs from upland sources in the summer?

¹ When addressing "human" or "anthropogenic" sources please describe what specific sources you are referring to, e.g. OSS, alders, pet waste, fertilizers, etc.

8. If OSS drainfield soils are unsaturated, is N from OSSs transported to Hood Canal? If so, by what mechanisms?
9. What sources of N found in groundwater in the Hood Canal watershed? How can we differentiate between these sources?
10. How much does groundwater (subsurface transport of nutrients) contribute to N loads to Hood Canal?
11. What is the predicted N loading impact of the four proposed wastewater plants with upland disposal?
12. How much do alder trees enhance nutrient loading from the watershed? How is this value derived?
13. What are the seasonal patterns of N loading from alders? Are there cumulative effects from alders that may affect oxygen levels in the summer?
14. What is the impact of timber management and harvest on dissolved oxygen in Hood Canal?
15. What is the N loading contribution from agriculture?
16. What types of land covers (forest, clear cuts, pastures, development, etc.) result in N loading to Hood Canal? What are their relative contributions of N? In what seasons?
17. Are there forestry or agricultural best management practices that may limit N loading?
18. How is "stormwater" defined in your research? What constituents are included?
19. What are the upper and lower bounds of stormwater contributions to N loading to Hood Canal?
20. Using data on stormwater N contributions, what land uses contribute the largest N loads?
21. How do road ditches and agricultural drainage ditches alter the natural movement (delivery and routing) of the nitrogen to Hood Canal?
22. Are there other pollutants of concern (besides nitrogen) for Hood Canal? If so, what are these pollutants and what are their sources?
23. Will increased population and/or development increase N loading to Hood Canal? And if so, from what sources?
24. What N sinks are present in the watershed or in Hood Canal? What mechanisms result in N removal?

B. Links between nutrient loading and dissolved oxygen in Hood Canal

25. How well does the hydrodynamic and biogeochemical model represent temperature, salinity, dissolved oxygen, and nutrient levels measured during the HCDOP?
26. What are model outcomes - a) if all OSS nitrogen loads are removed? b) if a development build-out scenario is modeled?
27. What model scenarios have been run (plan to be run) using the hydrodynamic and biogeochemical model and the marine model? What do these modeled scenarios tell us about corrective actions?
28. Is there a “tipping point” for N contributions to Hood Canal? If so, what is it?
29. What does the marine model tell us about hypoxia and nutrient loading in Hood Canal?
30. What are the predictions for larger scale stressors to dissolved oxygen in Hood Canal in the future (climate change, land development)? How are these stressors anticipated to effect conditions?
31. Have ecological risk assessments been conducted on low DO in Hood Canal? If so, what were the findings?